

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
10 January 2002 (10.01.2002)

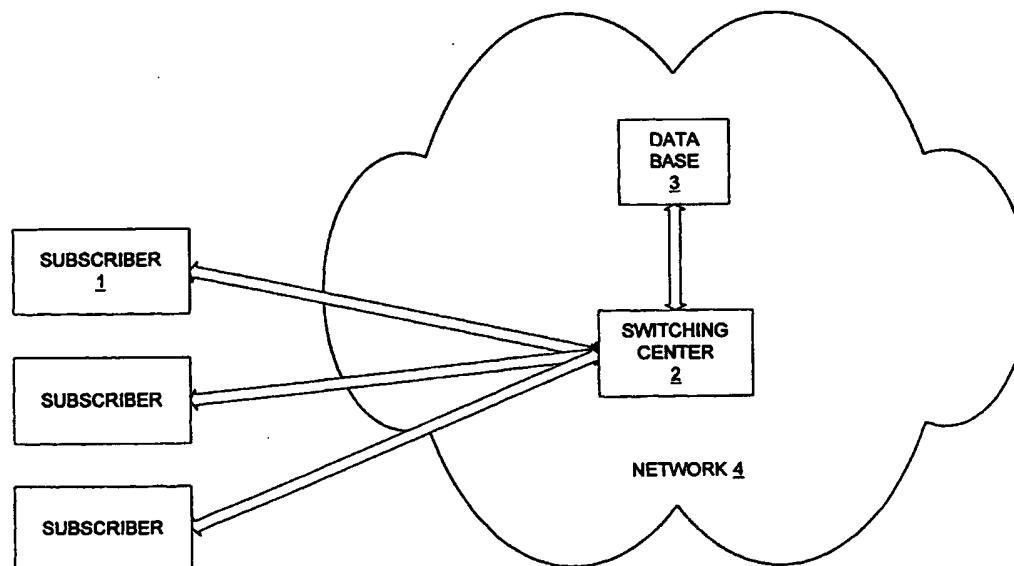
PCT

(10) International Publication Number
WO 02/03622 A1

- (51) International Patent Classification⁷: **H04L 12/56** (74) Agents: **LESON, Thomas, Johannes, Alois et al.**; Tiedtke-Bühling-Kinne, Bavariaring 4, D-80336 Munich (DE).
- (21) International Application Number: **PCT/EP00/06115**
- (22) International Filing Date: **30 June 2000 (30.06.2000)** (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (25) Filing Language: **English**
- (26) Publication Language: **English**
- (71) Applicant (*for all designated States except US*): **NOKIA CORPORATION** [FI/FI]; Keilalahdentie 4, FIN-02150 Espoo (FI).
- (72) Inventors; and
- (75) Inventors/Applicants (*for US only*): **HURME, Jaana** [FI/FI]; Vasaratie 24 C 18, FIN-33710 Tampere (FI). **LEHTIMÄKI, Jukka** [FI/FI]; Koskitie 23, FIN-34300 Kuru (FI). **BENKO, Balint** [HU/HU]; Csengettyu u. 16, H-1098 Budapest (HU).
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:
— *with international search report*

[Continued on next page]

(54) Title: **PRIORITIZATION OF SUBSCRIBERS IN A SWITCHING CENTER OF A TELECOMMUNICATION SYSTEM**



(57) Abstract: A switching method and a network element (2) applying this method are disclosed in which priorities are assigned to subscriber categories, subscriber categories of same priority are combined into a subscriber group and resources are reserved for each subscriber group. When a resource usage request in connection with a subscriber connection request is received from a subscriber (1), the subscriber group is determined to which the subscriber (1) belongs and a resource for the subscriber (1) is allocated out of the reserved resources for this subscriber group.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

PRIORITIZATION OF SUBSCRIBERS IN A SWITCHING CENTER OF A TELECOMMUNICATION SYSTEM

TITLE OF THE INVENTION

Prioritization of subscribers in switching center.

5 FIELD OF THE INVENTION

The present invention relates to a method for switching subscribers connecting to a switching apparatus providing services for the connected subscribers.

10

BACKGROUND OF THE INVENTION

In a PLMN (Public Land Mobile Network) like GSM (Global System for Mobile Communication) subscribers connect to the network through a switching center like MSC (Mobile-services Switching Center). The switching center acts as an exchange with some modifications specifically required to handle the mobile application. The switching center communicates with a data base like VLR (Visitor Location Register) which stores subscriber data and provides dynamic subscriber data management.

The switching center and the data base provide mobile service for the subscribers. Moreover, the switching center provides interworking function for the subscribers which is needed for speech and non-speech connections to external networks.

The subscribers connecting to the switching center may be classified according to different categories. For example, these categories comprise business, normal and telemetric categories.

When the data base capacity increases so that data of more subscribers are present than subscribers can be handled by

- 2 -

the switching center communicating with the data base, the switching center cannot perform all its functions without overloading.

5 In case of such an overload situation, the service for the subscribers connecting to the overloaded switching center is decreased. For example, when a subscriber of the business category connects to the overloaded switching center this subscriber may not be handled by the switching
10 center anymore, although a subscriber of the telemetric category which has connected to the switching center just before the business subscriber is handled.

SUMMARY OF THE INVENTION

15

It is therefore an object of the present invention to ensure service for subscribers belonging to a certain category. In addition, the service should be provided even in switching center overload situation.

20

This object is achieved by a switching method comprising the steps of:

assigning priorities to subscriber categories;
combining subscriber categories of same priority into
25 a subscriber group;
reserving resources for each subscriber group;
receiving a resource usage request in connection with a subscriber connection request from a subscriber;
determining the subscriber group to which the
30 subscriber belongs; and
allocating a resource for the subscriber out of the reserved resources for this subscriber group.

- 3 -

Moreover, this object is achieved by a network element for providing services for subscribers connecting thereto, the network element applying the above-mentioned method.

- 5 When the data base capacity (VLR capacity in GSM) is enlarged, switching center overload situations may become more frequent. According to the present invention, users can be prioritized and acceptable service levels for users with high priority can be ensured also in switching center
10 overload situations.

Further features of the present invention are defined in the dependent claims.

- 15 In the following the present invention will be described by way of a preferred embodiment thereof with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

20

Fig. 1 shows a schematic block diagram of a system comprising a switching center according to the present invention.

- 25 Fig. 2 shows a flowchart of an operation of the switching center according to the present invention.. []

Fig. 3 shows a flowchart of a more detailed operation of [] the switching center when allocating a resource for a
30 subscriber. []

Fig. 4 shows a schematic diagram of a resource allocation of a switching center according to the present invention.

- 35 DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 1 shows a system in which a subscriber 1 like a user of a mobile station connects to a network 4 through a switching center 2. As illustrated in Fig. 1, a plurality of subscribers can connect to the switching center 2.

The switching center 2 communicates with a data base 3 which stores data of subscribers connected to the switching center 2.

10

According to the present invention, the switching center 2 is able to perform ticketing, i.e. allocates resources for subscribers connecting to the switching center 2 which will be described in connection with Fig. 2.

15

In advance, the switching center 2 assigns a priority to each subscriber category used. As it is shown in Fig. 4, there may be a business category, a normal category and a telemetric category. According to the preferred embodiment, the switching center 2 gives the business category a high priority and the normal and telemetric categories a low priority (step S1 in Fig. 2). Then the switching center 2 groups together the categories having the same priority. That is, the business category forms a subscriber group having high priority and the normal and telemetric categories form a subscriber group having low priority (step S2).

As can be seen from Fig. 4, there is a subscriber queue belonging to the business category having high priority, and there are subscriber queues belonging to the normal and telemetric categories having low priority. In other words, there are two subscriber groups and three subscriber categories.

35

- 5 -

After that, the switching center 2 reserves resources for each subscriber group (step S3). The switching center 2 may for example reserve 60% of its resources for the group with high priority and the remaining 40% for the group with low
5 priority.

In case the switching center 2 receives a resource usage request from a subscriber 1 in connection with a subscriber connection request (step S4), it checks to which category
10 or subscriber group the subscriber 1 belongs (step S5). After having determined the group, the switching center 2 allocates a resource out of the resources reserved for the determined subscriber group for the subscriber 1 (step S6)..

15 The allocation of resources according to the preferred embodiment will be described in more detail with reference to Fig. 3. During a connection request, there can be several resource usage requests, and the connection setup fails if any of them fails. Hence, the operation of Fig. 3
20 may be applied several times during a connection setup.

When allocating a resource for the connecting subscriber 1, the switching center 2 first checks whether a resource for the determined subscriber group still is available (step
25 S61 in Fig. 3). If YES in step S61, the switching center 2 allocates the resource for the subscriber 1.

When the switching center 2 detects in step S61 that no resource is available for the determined subscriber group
30 to which the subscriber 1 belongs, or when it detects that more than a specific amount of resources, for example 95% of the resources, are in use, the switching center 2 checks in step S63 whether the determined subscriber group is a high priority group. If the switching center 2 detects in
35 step S63 that the subscriber 1 belongs to a high priority

- 6 -

group, i.e. the business category group according to the preferred embodiment, it advances to step S64 in Fig. 3.

In step S64 the switching center checks whether a resource reserved for a subscriber group having low priority is available. According to the preferred embodiment, the switching center 2 checks in step S64 whether a resource reserved for the normal and telemetric categories is available.

If YES in step S64, the switching center 2 allocates a resource out of the resources reserved for the low priority group for the subscriber 1 belonging to the high priority group (step S65).

As it is shown in Fig. 4, if the resources for the business category group subscribers are low, resources may be taken from the telemetric and normal subscriber group.

According to the present invention, subscribers are classified with respect to their category. To be precise, priorities are assigned to the different subscriber categories and categories with the same priority are grouped together. According to the preferred embodiment of the present invention, there are two groups, a high priority group comprising the business category and a low priority group comprising the normal and telemetric categories.

However, the present invention is not restricted to two groups and there can be one group for each category. According to Fig. 4, there may be a further dotted line between the normal and telemetric categories, forming three subscriber groups. Then, in case resources for the normal category group subscribers are running out, resources can

- 7 -

be taken from the telemetric subscriber category group. Furthermore, a top priority group for emergency calls and the like can be introduced.

- 5 Furthermore, according to the preferred embodiment, the resources of the switching center 2 are divided between the groups. Preferably, the high priority group has the biggest part of resources reserved.
- 10 In an overload situation when the resources reserved for high or higher priority subscribers have run out, some resources out of the resources reserved for the low or lower priority groups can be reallocated for the high or higher priority groups.

15

The resource reservation for each subscriber group can also be made dynamically during operation. Moreover, priorities may be assigned dynamically to the subscriber categories during operation. According to Fig. 4, when the normal

20 subscriber category is given the same priority as the business subscriber category, the dotted line in Fig. 4 moves down, thus forming a business and normal subscriber group and a telemetric subscriber group, and it becomes possible that a normal subscriber gets resources also from

25 the business category if there are extra resources in this category. () []

According to the present invention, users can be prioritized and acceptable service levels for users with

30 high priority can be ensured also in switching center^{1,2} overload situations.

The present invention is not limited to a specific switching technology and is also applicable in packet

35 switched networks like IP (Internet Protocol) networks.

- 8 -

Thus, also the term switching is not limited to conventional switching performed in circuit switched networks, but it is to be interpreted broadly, i.e. including also the switching done e.g. in all IP networks,
5 so that, in some cases, it could also be called routing.

While the invention has been described with reference to a preferred embodiment, the description is illustrative of the invention and is not to be construed as limiting the
10 invention. Various modifications and applications may occur to those skilled in the art without departing from the true spirit and scope of the invention as defined by the appended claims.

CLAIMS:

1. A switching method comprising the steps of:
assigning (S1) priorities to subscriber categories;
5 combining (S2) subscriber categories of same priority
into a subscriber group;
reserving (S3) resources for each subscriber group;
receiving (S4) a resource usage request in connection
with a subscriber connection request from a subscriber (1);
10 determining (S5) the subscriber group to which the
subscriber (1) belongs; and
allocating (S6) a resource for the subscriber (1) out
of the reserved resources for this subscriber group.
- 15 2. The method according to claim 1, wherein a predetermined
amount of resources is reserved for each subscriber group.
3. The method according to claim 2, wherein the
predetermined amount of reserved resources for a subscriber
20 group with a high priority is higher than the predetermined
amount of reserved resources for a subscriber group with a
low priority.
4. The method according to claim 1, wherein the resources
25 for each subscriber group are reserved dynamically during
operation. []
5. The method according to claim 1, wherein in case that
reserved resources for a high priority subscriber group
30 reach a specific limit, resources out of reserved resources
for a low priority subscriber group are allocated for a
high priority group subscriber.

- 10 -

6. The method according to claim 1, wherein the priorities are assigned to the subscriber categories dynamically during operation.
- 5 7. The method according to claim 1, wherein the subscribers are subscribers in a packet switched telecommunication system.
8. A network element (2) for providing services for
10 subscribers (1) connecting to the network element (2) applying the method according to one of claims 1 to 7.
9. The network element according to claim 8, wherein the network element is an element responsible of call control
15 or switching of connections.
10. The network element according to claim 8, wherein the network element is part of a packet switched telecommunication system.

20

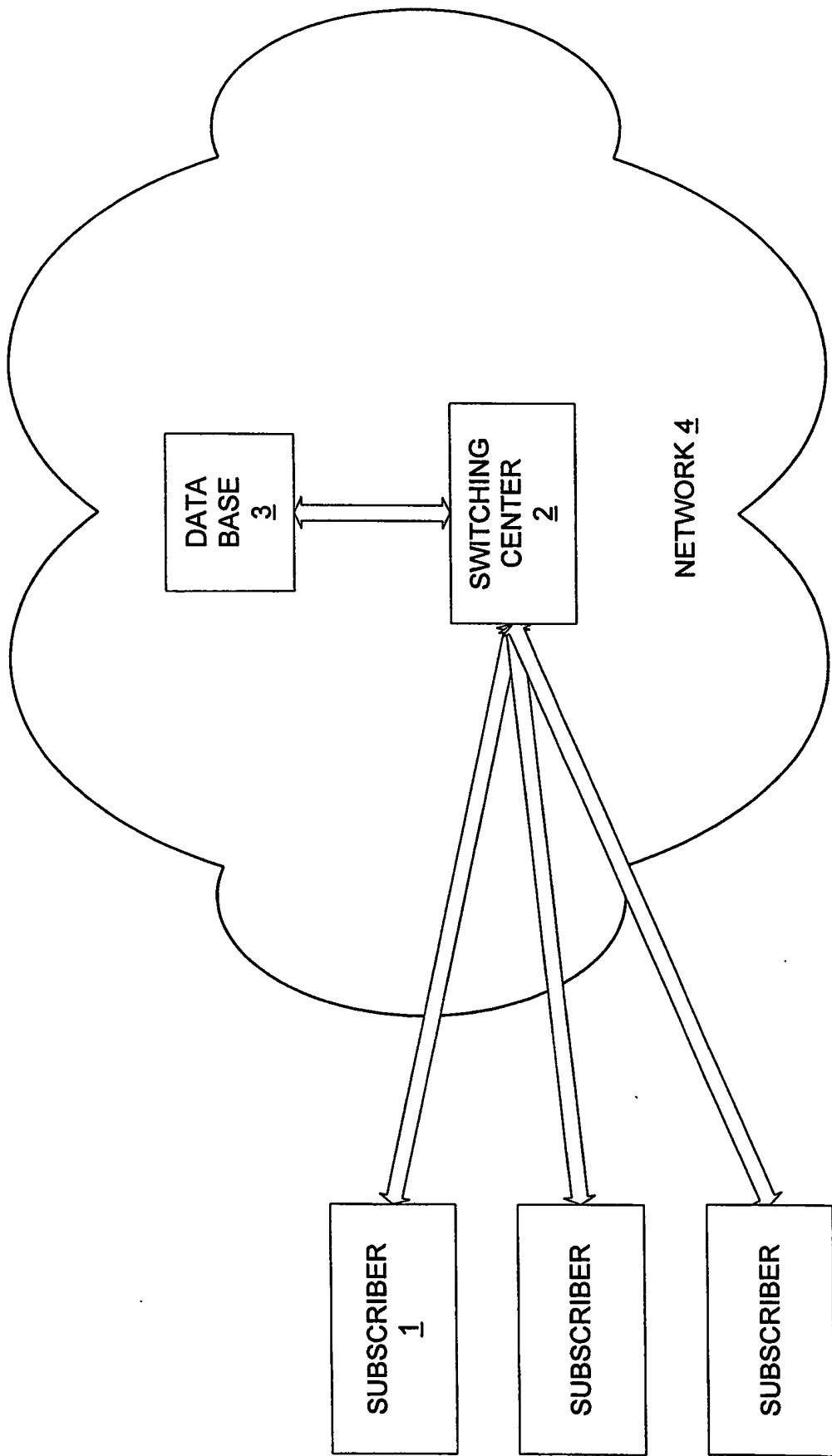
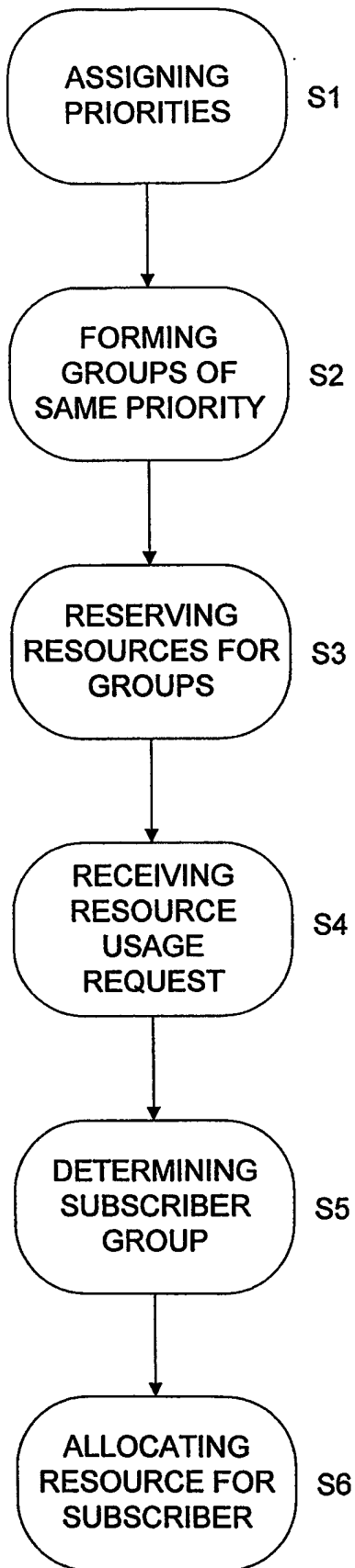
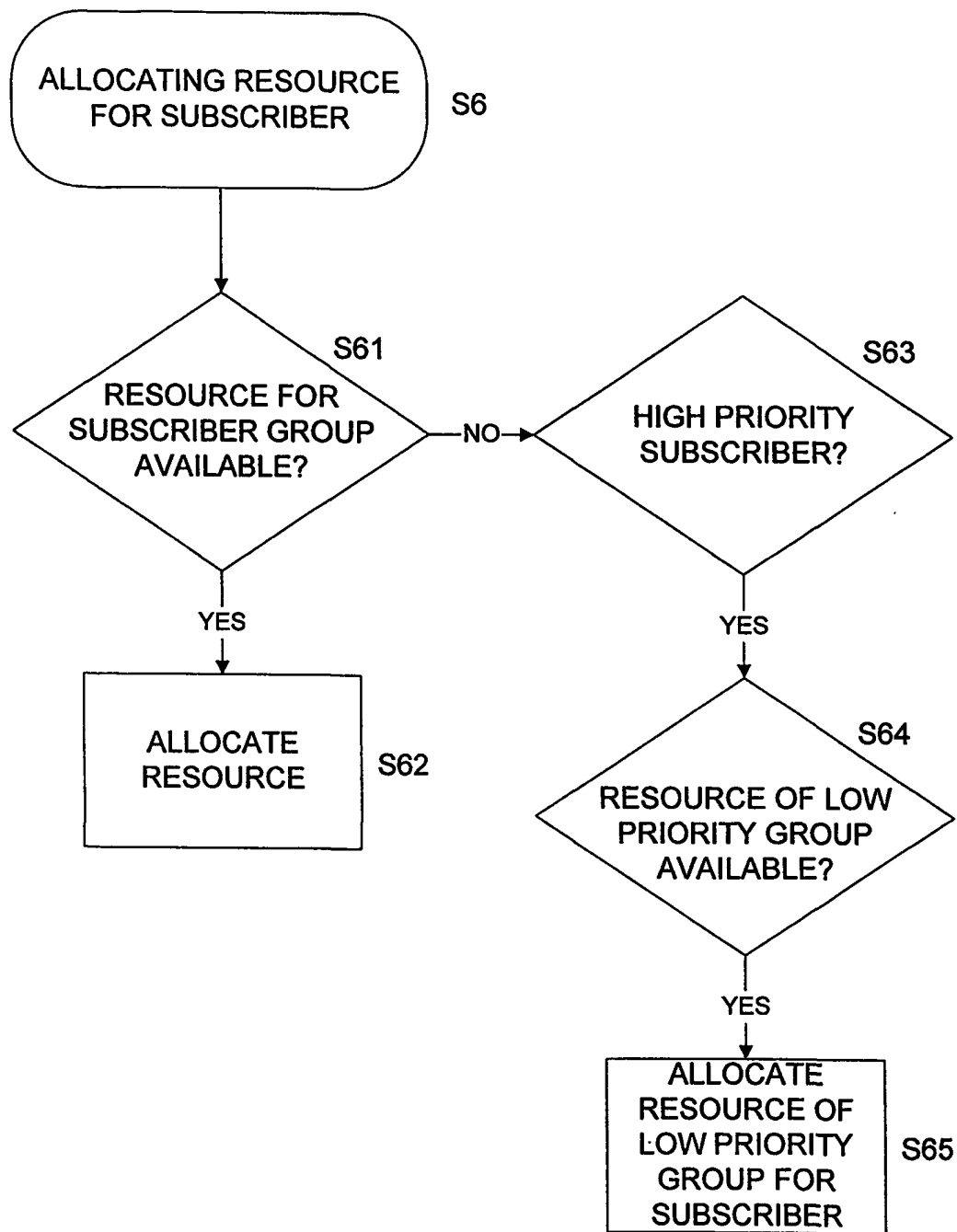
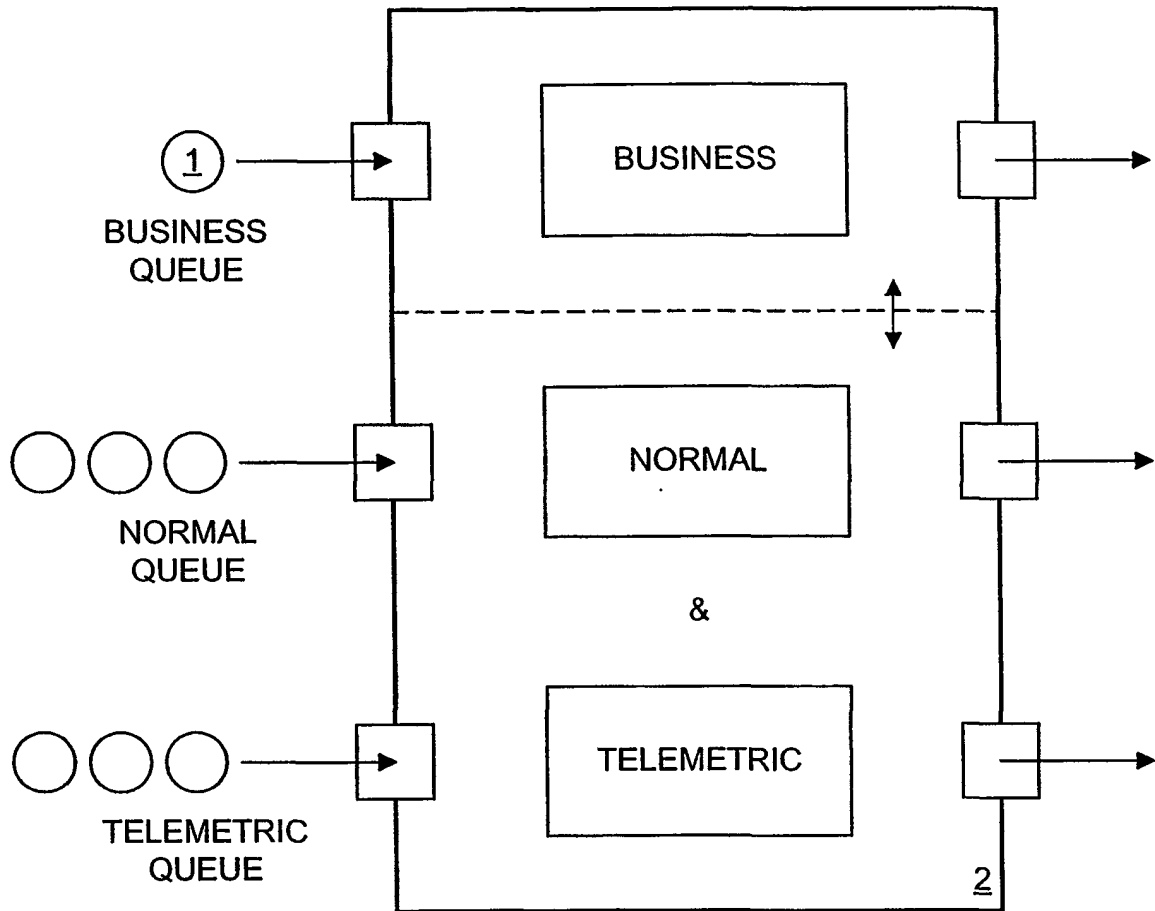


FIG. 1

**FIG. 2**

**FIG. 3**

**Fig. 4**

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H04L12/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04L H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 714 192 A (IBM) 29 May 1996 (1996-05-29) page 15, line 18 -page 17, line 44	1-10
A	EP 0 790 726 A (LUCENT TECHNOLOGIES INC) 20 August 1997 (1997-08-20) page 4, line 15 - line 24 page 6, line 16 - line 41	1-10
A	US 5 574 977 A (HOUE MICHAEL ET AL) 12 November 1996 (1996-11-12)	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the international search

31 July 2001

Date of mailing of the international search report

06/08/2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax: (+31-70) 340-3016

Authorized officer

Schut, G

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 0714192	A	29-05-1996	US	5687167 A	11-11-1997
EP 0790726	A	20-08-1997	US	5781624 A	14-07-1998
			CA	2197585 A	17-08-1997
			JP	10028141 A	27-01-1998
US 5574977	A	12-11-1996	AU	719754 B	18-05-2000
			AU	5410896 A	07-11-1996
			BR	9608248 A	29-06-1999
			CA	2217243 A	24-10-1996
			NZ	305967 A	29-04-1999
			WO	9633584 A	24-10-1996